by the Jews [Levit. xi. 22], and Herodotus mentions a tribe of Ethiopians which fed on locusts, which came in swarms from the southern and unknown districts.

Mr. Riley speaks of good broth being made "by boiling the unfledged *Caloptenі* for two hours in a proper quantity of water, and seasoned with nothing but pepper and salt; the broth is hardly to be distinguished from beef broth." Boiled, fried, or roasted the full-grown are said to make pleasant food, and ground and compressed they will keep a long time. The other uses suggested are as fish bait, as manure, and as a source of formic acid.

There are altogether twenty-seven appendices occupying 279 pages, the last appendix giving the bibliography of the subject.

GUTHRIE'S PHYSICS

Practical Physics, Molecular Physics, and Sound. By Frederick Guthrie, Ph.D., F.R.SS. L. and E., Professor of Physics in the Royal School of Mines, London. (London: Longmans, Green, and Co., 1878.) [London Science Class-Books, edited by G. Carey Foster, F.R.S., and Philip Magnus, B.Sc., B.A.]

"THE works comprised in this series," the editors tell us, "will all be composed with special reference to their use in school-teaching; *but*, at the same time, particular attention will be given to making the information contained in them trustworthy and accurate, and to presenting it in such a way that it may serve as a basis for more advanced study."

The little word *but*, which we have taken the liberty to emphasise, seems to hint at some opposition between accurate statements and school-teaching, which, if not a fundamental necessity, is at least a universally existing phenomenon in the present order of things. This series of class-books is by no means the first attempt to procure books for children from writers of scientific reputation; and Prof. Guthrie, the author of this little book on practical physics, has himself invented several experimental methods at once interesting, ingenious, and simple.

If a child has any latent capacity for the study of nature, a visit to a real man of science at work in his laboratory may be the turning-point of his life. He may not understand a word of what the man of science says to explain his operations, but he sees the operations themselves, and the pains and patience which are bestowed on them; and when they fail he sees how the man of science, instead of getting angry, searches for the cause of the failure among the conditions of the operation.

Accordingly, in this little book the parts which are most interesting, whether to young or old, are those in which Prof. Guthrie describes his own beautiful experiments on the size of drops and bubbles, or teaches us how to blow glass. But if he once opens his ears to the siren song of the scientific imagination, floating down from heights unprofaned by experiment, through the window of the laboratory, and makes three paces through the room from the blowpipe to the lecture-table, we know that the curse has come upon him, and that for him it will never more be possible to reconcile the claims of accuracy with those of school-teaching.

What but some vile enchantment could have induced an intelligent man to begin his discourse to the poor little children in this style:—

> "§ 1. **Hardness. Form-elasticity.**—The pressure required to alter the relative positions of two contiguous parts of a body measures its hardness. As this pressure is greater with greater surface of contact, some unit of surface must be fixed upon. The term hardness is generally applied loosely to difficulty of fracture. The following remarks may show that our speech and ideas in regard to hardness are deficient in precision. Glass is said to be harder than lead, yet a glass cup is more easily broken than a leaden one—more easily broken, though not so easily bent. Hard bodies are always elastic; elastic bodies are not necessarily hard, nor are they necessarily brittle, nor are soft bodies necessarily plastic. Toughness seems to imply a resistance to change of form, which resistance increases more rapidly than the displacement; thus, while a band of vulcanised caoutchouc will be extended to a degree proportional to the weight hung at one end, a leathern strap will not be extended twice as far if the weight on it is doubled. Toughness is generally associated with texture, and stretching causes partial fibration in the line of pull."

Here is a teacher who, with all the stores of science to choose from, selects, as the first lesson to a child, the necessity of fixing on a unit of surface, which, however, he makes no attempt to do, but goes on to harangue him on the deficiency in precision of our ideas and language in regard to hardness.

The poor child is not responsible for this want of precision; his first duty is not to reform his language, or even to criticise it, but to learn it, and if there is any part of human knowledge about which our speech and ideas have become tolerably precise, let us teach him that first, so that he may have some hope that knowledge is attainable before we let him see, as we must at last, how confused our own notions are.

Whether a child receives any special instruction in science or not, it is of unspeakable advantage to him if he is not put in the way of explaining things by false hypotheses. The difficulty which we have in recognising the paradoxical character of some of the most celebrated paradoxes shows how much has been done by the teachers of the last two centuries in causing false principles to be forgotten. The paradoxes are no longer paradoxical, because the dogmas which made them so are now known only to the owls and the bats.

We have selected a few statements in this book which we do not remember to have seen before.

> (When a wire is stretched by a weight) "it may be assumed that the volume of the metal remains approximately unchanged, so that if the elongation is such that the length m becomes n, the original diameter d becomes $d\sqrt{\frac{m}{n}}$" (p. 4).
>
> "A drop of water on a board strewed with powdered resin is nearly spherical." "The spherical is the form in which the mean distance of all parts from the centre of mass is the least. It is the most compact form for a given mass. This shows that cohesion moulds the drop to the spherical form" (p. 8).

Does Prof. Guthrie take his science from Rogers' verses on a tear? We refer him to Shakespeare ("King John," Act iii. Sc. 4) as a better authority on Capillary Attraction:—

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> "Bind up those tresses: O, what love I note
> In the fair multitude of those her hairs!
> Where but by chance a silver drop hath fallen,
> Even to that drop ten thousand wiry friends
> Do glue themselves in sociable grief,
> Like true, inseparable, faithful loves,
> Sticking together in calamity."

"A more exact method" (of measuring the viscosity of gases) "is to place timed chronometers under bell-jars containing various gases, and also *in vacuo*" (p. 19).

"**Diffusion of Gases into Gases.**—The unhampered diffusion of gases into gases has been little studied" (p. 39).

"Experiments show that the more a gas is soluble in a liquid the more is the liquid volatile in the gas" (p. 45).

"Whether the feeling called pitch depends upon the appreciation of the rapidity of sequence or upon the duration of each distortion of the ear-drum is not easy to decide, for the one is the inverse of the other. Perhaps the fact that a single long wave produces a different impression from that produced by a single short wave, and that this difference reminds one of the differences between grave and shrill notes, may be regarded as evidence that duration of individual impression rather than rate of sequence is to be considered as the origin of pitch" (p. 77).

After reading these statements, we have come to regard it as a decided merit, that in this book on Molecular Physics we are not told anything about molecules. The value of the book would be increased by cutting out "Molecular Physics" from the title, together with everything in the book included under that heading, and devoting the whole book to Practical Physics as adapted to the capacities and opportunities of young students.

J. CLERK MAXWELL

OUR BOOK SHELF

The Journal of the Royal Agricultural Society of England. Part II. (London: John Murray, 1878.)

THIS is no ordinary number of an agricultural journal. It is, in fact, a memoir on the agriculture of England and Wales, prepared under the direction of the Royal Agricultural Society, and presented by them at the International Congress held in Paris during the present summer. The memoir is now issued as the second part of the Society's *Journal* for the current year.

The memoir is well worthy of the Society under whose auspices it has appeared. It forms a large volume of over six hundred pages, and contains ten treatises on different aspects of English agriculture, each the work of a distinct author.

The first article in the memoir is a "General View of British Agriculture," by Mr. Caird. He commences with statistics as to the home and foreign supply of food, then glances at the changes introduced in agriculture during recent years by the increased use of machinery, and of artificial foods and manures, and last, though not least, by free trade. After a very brief notice of the differences of climate and soil in England he comes to his main subject—"the landed property of England," its character, distribution, ownership, improvement, value, and relation to Government. The whole essay is written with remarkable ability, and is full of important information.

The second article is on "English Land-law," by F. Clifford and J. A. Foote. It treats of succession, tenancies, agreements, leases, and recent legislation on the subject of unexhausted improvements. The third article is by Capt. Craigie; it deals with "Taxation," and describes the various kinds of taxation, and their incidence on the various classes connected with agriculture. This is followed by a short paper on "Farm Capital," by E. P. Squarey.

The fifth article is by much the longest in the volume; it has for its scope the whole subject of "Practical Agriculture"; it is written by Mr. J. A. Clarke. The article commences with a sketch of the climate and geology of England, and then proceeds to give statistics as to the crops produced, the number of live-stock maintained, the imports of manure and food, and the prices of agricultural products. Then follow chapters on the management of cattle, sheep, and pigs, with a description of the various breeds of live-stock, including horses. Crops and manures are then discussed, the practice of good farms in different parts of England being indicated. The concluding chapter is on machinery, and cultivation by steam. The whole article covers nearly two hundred pages; it is full of practical information, condensed into a small compass.

The sixth article treats of "Dairy Farming," and is written by Mr. J. C. Morton; to this is added an appendix on "Pastoral Husbandry," by W. T. Carrington. Mr. Morton, after reviewing the statistics of the subject, proceeds to describe the various breeds of cattle employed for dairy purposes in England, illustrating this part of his paper by wood-cuts. He then treats of the rearing of calves, the sale of milk, and the production of cheese and butter, describing in each case the practice of different parts of the country.

The seventh article treats of "The Cultivation of Hops, Fruit, and Vegetables," and is the work of Mr. C. Whitehead. It is naturally divided into three chapters. The subjects are treated statistically and practically, and much important information is given.

The next paper is of special interest at the present time, it is on "The Agricultural Labourer," and is written by Mr. H. J. Little. The past history of the British labourer is sketched, and his condition in various parts of the country described. His earnings, expenses, domestic life, education, and provident societies are treated of, and evidently by one who can speak from personal knowledge of the subject.

The ninth paper is the only one of a strictly scientific character; it deals with the "Influence of Chemical Discoveries on the Progress of English Agriculture," and is the work of Dr. A. Voelcker. The scope of this paper is hardly so large as its title, as the author generally limits his remarks to investigations made since 1860, and has nothing to say of Continental discoveries. The paper is for the most part an account of the investigations made by Messrs. Lawes and Gilbert at Rothamsted, and of the work done by the author himself. The subjects treated of are—The Soil, Continuous Cropping, Manures, Improvement of Permanent Pastures, Feeding and Rearing of Stock, Industries attached to the Farm, Experimental Stations.

The volume fitly concludes with an article on the history and work of "The Royal Agricultural Society," written by Mr. J. M. Jenkins, the Secretary of the Society.

It will be seen that the memoir issued by the Royal Agricultural Society includes a wide range of subjects; it would be hard indeed to find another volume containing as much information on English agriculture in the same compass. The whole is published at the extremely low price of six shillings. We trust that it will find a large circulation

R. W.

A Visit to South America; with Notes and Observations on the Moral and Physical Features of the Country, and the Incidents of the Voyage. By Edwin Clark, C.E. (London: Dean and Son, 1878.)

MR. CLARK'S modest little narrative is considerably superior to the ordinary run of modern books of travel, which have become as plentiful, nearly, as novels, though we are glad to say, on the average, much more worth reading. Mr. Clark has certain scientific qualifications

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